SEC *Signature* EtO Monitor

Instruction and Operation Manual

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Part Number 71-3000 Version 080601

Sensor Electronics Corporation

Sensor Electronics Corporation (SEC) is an innovative manufacturer of fixed system gas detection equipment, for combustible gases, oxygen and toxic gases.

Commitment

Our quality and service are uncompromising. We back each of our products with a two-year warranty on all materials and workmanship. We offer technical support, user training and on-site service and maintenance of equipment to meet the needs of our customers.

Gas Detection Service

Individually designed maintenance packages are available for specific customer needs. Service begins with verification of the system installation that includes an initial system check and calibration. We then offer customer training programs (on-site and at factory) to insure that technical personnel fully understand operation and maintenance procedures. When on-the-spot assistance is required, service representatives are available to handle any questions or problems immediately.

WARRANTY

SENSOR ELECTRONICS CORPORATION (SEC) WARRANTS PRODUCTS MANUFACTURED BY SEC TO BE FREE FROM DEFECTS IN WORKMANSHIP AND MATERIALS FOR A PERIOD OF TWO (2) YEARS FROM DATE OF SHIPMENT FROM THE FACTORY. ANY PARTS RETURNED FREIGHT PRE-PAID TO THE FACTORY AND FOUND DEFECTIVE WITHIN THE WARRANTY WOULD BE REPAIRED OR REPLACED, AT SEC'S OPTION. SEC WILL RETURN REPAIRED OR REPLACED EQUIPMENT PRE-PAID LOWEST COST FREIGHT. THIS WARRANTY DOES NOT APPLY TO ITEMS, WHICH BY THEIR NATURE ARE SUBJECT TO DETERIORATION OR CONSUMPTION IN NORMAL SERVICE. SUCH ITEMS MAY INCLUDE:
CHEMICAL SENSOR ELEMENTS
FUSES AND BATTERIES.
WARRANTY IS VOIDED BY ABUSE INCLUDING ROUGH HANDLING, MECHANICAL DAMAGE, ALTERATION OR REPAIR. THIS WARRANTY COVERS THE FULL EXTENT OF SEC LIABILITY AND SEC IS NOT RESPONSIBLE FOR REMOVAL, REPLACEMENT COSTS, LOCAL REPAIR COSTS, TRANSPORTATION COSTS OR CONTINGENT EXPENSES INCURRED WITHOUT PRIOR WRITTEN APPROVAL. SENSOR ELECTRONICS CORPORATION'S OBLIGATION UNDER THIS WARRANTY SHALL BE LIMITED TO REPAIR OR REPLACEMENT OF ANY PRODUCT THAT HAS BEEN RETURNED TO SENSOR ELECTRONICS CORPORATION FOR WARRANTY CONSIDERATION. THIS WARRANTY IS EXPRESSLY IN LIEU OF ANY AND ALL OTHER WARRANTIES EXPRESSED OR IMPLIED, AND ALL OTHER OBLIGATIONS OR LIABILITIES ON THE PART OF SENSOR ELECTRONICS CORPORATION INCLUDING BUT NOT LIMITED TO, THE FITNESS FOR A PARTICULAR PURPOSE. IN NO EVENT SHALL SENSOR ELECTRONICS CORPORATION BE LIABLE FOR DIRECT, INCIDENTAL, OR CONSEQUENTIAL LOSS OR DAMAGE OF ANY KIND CONNECTED WITH THE USE OF IT'S PRODUCTS OR FAILURE TO FUNCTION OR OPERATE PROPERLY.

Table of Contents

I. SPECIFICATIONS

Model: SEC EtO Signature

Range (adjustable): 0-2000 milligrams/liter (maximum)

Part Number: 142-0597

Detection Method: Diffusion

Construction: Housing is anodized aluminum with sapphire windows.

Rating: Class 1, Division 1, Groups B, C and D,
CSA (Canadian Standards Association) and FM (Factory Mutual)

RFI/EMI Protection: EN-50081-1
EN-50082-1

Accuracy: +/- 5% measured value or +/- 3% full scale (whichever greater)

Repeatability: +/- 3%

Operating Temperature Rating: +25°C to +65°C (maximum)
+77°F to +149°F (maximum)

Operating Voltage: 24 VDC. Operating range 18 to 32 VDC measured at the detector head.

Output (analog): 4-20 mA (Source type), max. 1000 Ohm load at 24 VDC supply voltage.

Output (digital): Interactive PC Link

Average Power Consumption at 24 VDC: 6 watts

Current Draw at 24 VDC: 250 mA (average)
450 mA (peak)

Mechanical connection to sterilizer: ¾" NPT male

Electrical connection: ¾" NPT male

Weight: 18 ounces

Wire Connections: Red wire (+ 24 VDC)
Black wire (D.C. common)
Blue wire (4-20 mA output signal)
White wire (Calibration / digital interface)

Declaration of Conformity

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Type of Equipment: SEC Signature EtO Monitor
SEC IR PC Link

Model Number: SEC Signature EtO Monitor - Part Number 142-0597
SEC IR PC Link - Part Number 142-0636

I hereby declare that the equipment specified above conforms to the protection requirements of the **EC DIRECTIVE 89/336/EEC** on Electromagnetic Compatibility (EMC), in accordance with the provisions of the Electromagnetic Compatibility Regulations 1992.

The following standards have been applied;

EN 50081 –1
Emissions Standard (Residential Commercial and Light Industry)

EN 50082 –1
Immunity Standard (Residential Commercial and Light Industry)

Signature _____

Patrick G. Smith
Director of Engineering

Date: August 6, 2001

II. GENERAL DESCRIPTION

The SEC Signature EtO monitor is a microprocessor based intelligent device that continuously monitors levels of EtO in sterilization chambers.

The SEC Signature EtO monitor is a stand alone device providing a 4 to 20 mA signal corresponding to actual concentrations of ethylene oxide.

Features

- Requires minimal routine calibration to ensure proper operation.
- Continuous self-test automatically indicates a fault, with fail to safe operation.
- A multi-layered filtering system protects optics from dirt and water ingress.
- Straight optical path eliminates the need for mirrors, reflective surfaces or beam splitters thereby increasing the stability and reducing the maintenance of the device.
- Discourages condensation interference by internally heating optical chamber.
- Standard 4 to 20 mA output (current source).
- Explosion proof housing designed for duty in harsh environments.
- Smart Calibration AutoAC™ circuit.

Theory of Operation

The SEC Signature EtO monitor uses infrared absorption technology for detecting hydrocarbon gas concentrations. Gases absorb infrared light only at certain wavelengths. The concentration of a gas can be measured by the difference of two channels (wavelengths), a reference and a measurement channel. The SEC Signature EtO monitor uses an infrared light source at one end and a dual channel receiver at the opposite end. The dual channel receiver measures the intensity of two specific wavelengths, one at an absorption wavelength and another outside of the absorption wavelength. The gas concentration is determined by a comparison of these two values.

The dual channel receiver is a single wafer, double filtered, dual receiver with an internal optical barrier. The elements are perfectly matched resulting in overall stability and superior performance throughout the entire temperature range. By using this dual channel receiver there is no need to use any special lenses or beam splitters to achieve the dual measurement bands.

The SEC Signature EtO monitor utilizes a unique Automatic Analog Control circuit, the AutoAC™ circuit (Patent Pending). The AutoAC™ continuously makes adjustments to null out effects from temperature, component drift, dirty optics, interferents and aging. These adjustments are made according to algorithms derived from infrared gas absorption theory. The AutoAC™ circuit is continuously checking all unit operating parameters. If any parameter goes out of tolerance, the AutoAC™ circuit sets a fault code appropriate to the problem. The AutoAC™ circuit ensures that once the unit is spanned, it will remain accurate as long as the zero is accurate. Simply calibrate (span one time) the unit with a specific amount of EtO gas and the device will repeatable track the EtO concentrations in the chamber throughout the entire load cycle. The only ongoing calibration that is necessary is an occasional zero.

III. INSTALLATION

Mechanical

The SEC Signature EtO monitor has a ¾" male NPT threaded connector for installing the device on the sterilizer. Ideally the device can be installed on the recirculation line (see Figure 4). The device is vacuum tested at the factory to 1 inches of mercury absolute and pressure tested to 40 psi.

Electrical

The SEC Signature EtO monitor has a ¾" male NPT threaded connector (with 4 wires) for mounting the detector to a junction box. SEC can provide a junction box for this purpose with terminals (see Figure 5).

A user-supplied junction box can also be used, providing it has the appropriate sized NPT conduit entries. This junction box must be suitable for use in the application and location in which it is being installed.

Wiring connections

Red wire:	18 to 32 VDC
Black wire:	DC negative (common)
Blue wire:	4 to 20 mA output
White wire:	Smart Calibration Wire (data wire)

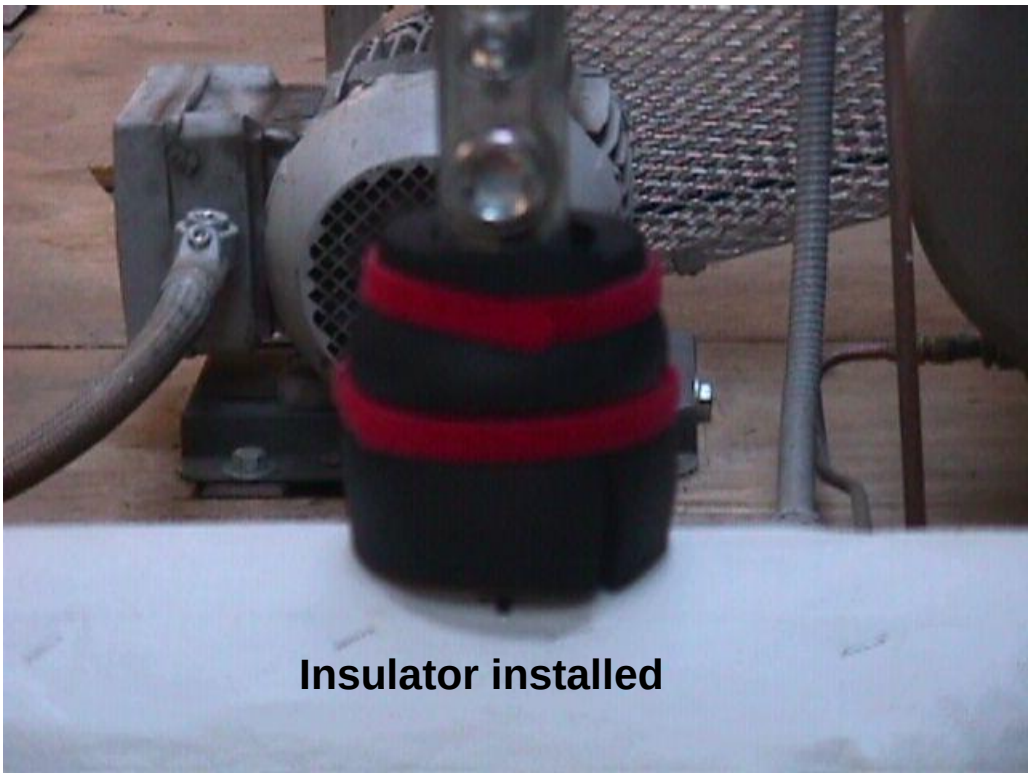
Refer to Figures 2 and 3 for general wiring details.

Insulator

The SEC EtO Signature gas monitoring device's internal temperature should be at least 10º F warmer than the sterilizer. *The internal temperature of the Signature can be monitored using the SEC IR PC LINK software package.*

Before insulator is installed

If the internal temperature is not 10º F above the process sterilizer then a simple insulator can be installed around the SEC EtO Signature gas monitor.



Insulator installed

IV. CALIBRATION / OPERATION

Zeroing

Zeroing the SEC Signature EtO monitor is the only regular calibration (maintenance) operation required.

SEC Signature EtO monitor zero calibration is initiated by connecting the calibration lead (white wire) to the negative lead (DC common) of the power supply for ten (10) seconds and releasing. Although this can be accomplished manually, installation of a switch is recommended. It is recommended that this switch be a momentary type switch to prevent it from inadvertently being left in the calibrate position. The zero calibration operation is initiated at the rising edge (releasing). The zero initiation can be verified at on the 4 to 20 mA output (2.2 mA)

Note: For best accuracy, the unit should be powered up for at least 30 minutes before any calibration operation.

Note: Zero the SEC Signature EtO monitor after the nitrogen wash(es) and at the end of the humidity dwell just before adding EtO into the chamber.

Current Output and Corresponding Status Table

Current Output	Status
4-20 mA	Normal measuring mode
0.0 mA	Unit Fault
0.2 mA	Reference channel fault
0.4 mA	Analytical channel fault
0.8 mA	Unit warm up
1.0 mA	Optics fault
1.2 mA	Zero drift fault
1.6 mA	Calibration fault
2.0 mA	Unit spanning
2.2 mA	Unit zeroing
4.0 mA	Zero gas level
20 mA	Full scale

The 4 to 20 mA output of is a non-isolated current source.

Warm-up

When power is applied to the detector, it enters a one (1) minute warm-up mode in which time it performs diagnostic checks and allows the sensor to stabilize before beginning normal operation. The current output during this period is 0.8 milliamperes. At the end of the warm-up period with no faults present, the detector automatically enters the normal operating mode. If a fault is present after warm-up, the detector current output will indicate the fault (see chart above).

Normal

In the normal operating mode, the 4 to 20 mA signal levels correspond to the detected gas concentration. The device continuously performs self diagnostics, checks for calibration requests and displays operating status (see table).

Spanning

Spanning is only required to establish measurement range. The span point becomes the mid range point of the SEC Signature EtO monitor. When the SEC Signature EtO monitor is spanned at 520 mg/l full scale range is 0 to 1040 mg/l.

The SEC Signature EtO monitor is factory coarse spanned with ethylene span gas to a range of 0-1000 mg/l.

Spanning the SEC Signature EtO monitor in field by connecting the SEC Signature EtO monitor to the SEC IR PC Link (P/N 142-0636) and a computer (provided by others) running the software (provided by SEC). The software is compatible with most versions of Microsoft® Windows® (3.1 to 98). The SEC software will not run on Windows NT® or 2000. Please contact the factory for further details.

During the spanning routine, the current output of the SEC Signature EtO monitor will go to 2.0 mA.

Note: For best accuracy, the unit should be powered up for at least 30 minutes before any calibration operation.

Calibration Certification

Document: 7205 Rev. 1.003

Customer:

Sales Order:
Ship Date:

SEC EtO Signature Serial #	Cal Date	Cal Gas Value (Ethylene)	Span Hex Value	Check Sum (Linearization)	Firmware Rev
		70% Volume +/-2% NIST Traceable			

Calibration Procedure: 7204
Test Procedure: 7202

TEST PERSON SIGNATURE PRINT NAME DATE

_____ _____ _____

70%V/V Ethylene generates a unit response approximately equivalent to 500 mg/l ethylene oxide. This results in a range of 0-1000mg/l.
Best accuracy requires the unit to be zeroed and spanned in-chamber at operating temperature and humidity, using a typical concentration of EtO for spanning.

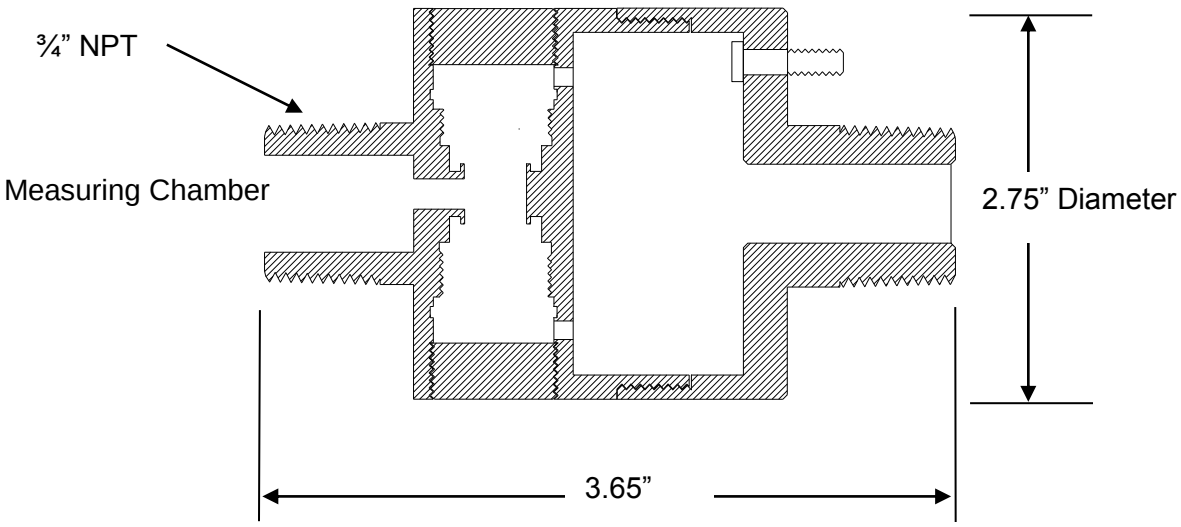
Example of Calibration Certification
Each SEC Signature is shipped with a completed Calibration Certification.

V. PARTS LIST

Part Number	Description
142-0597	SEC Signature EtO monitor
142-0636	SEC IR PC Link Kit
	Replacement Filter Kit
142-0876	Insulator
190-1000	SEC 2001 Explosion proof junction box

VI. DRAWING SECTION

Figure #	Title
Figure 1	Overall Layout
Figure 2	Wiring Diagram
Figure 3	Block Wiring Diagram
Figure 4	Mechanical Diagram
Figure 5	Sensor Separation Kit



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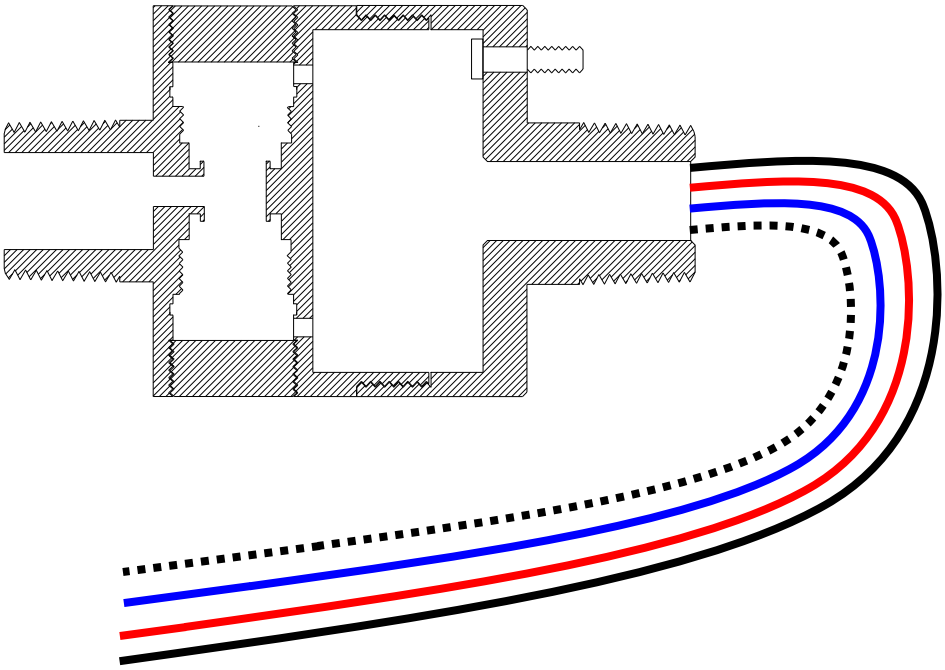
OVERALL LAYOUT
SEC EtO Signature

FIGURE 1



Wire Connections:
Red wire (+ 24 VDC)
Black wire (D.C. common)
Blue wire (4-20 mA output signal)
White wire (Calibration / digital interface)

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WIRING DIAGRAM
SEC EtO Signature

FIGURE 2

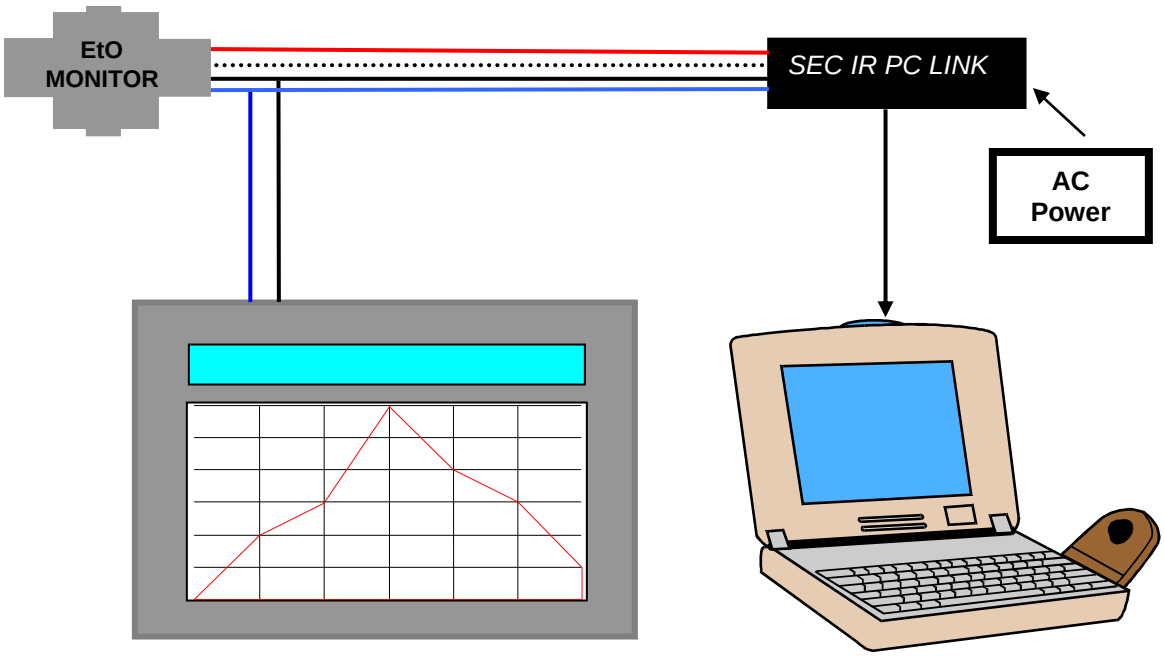

Chart Recorder
PLC, DAS, DCS, DVM
(Any control or monitoring system that accepts a 4-20 mA or 0-5 VDC signal)

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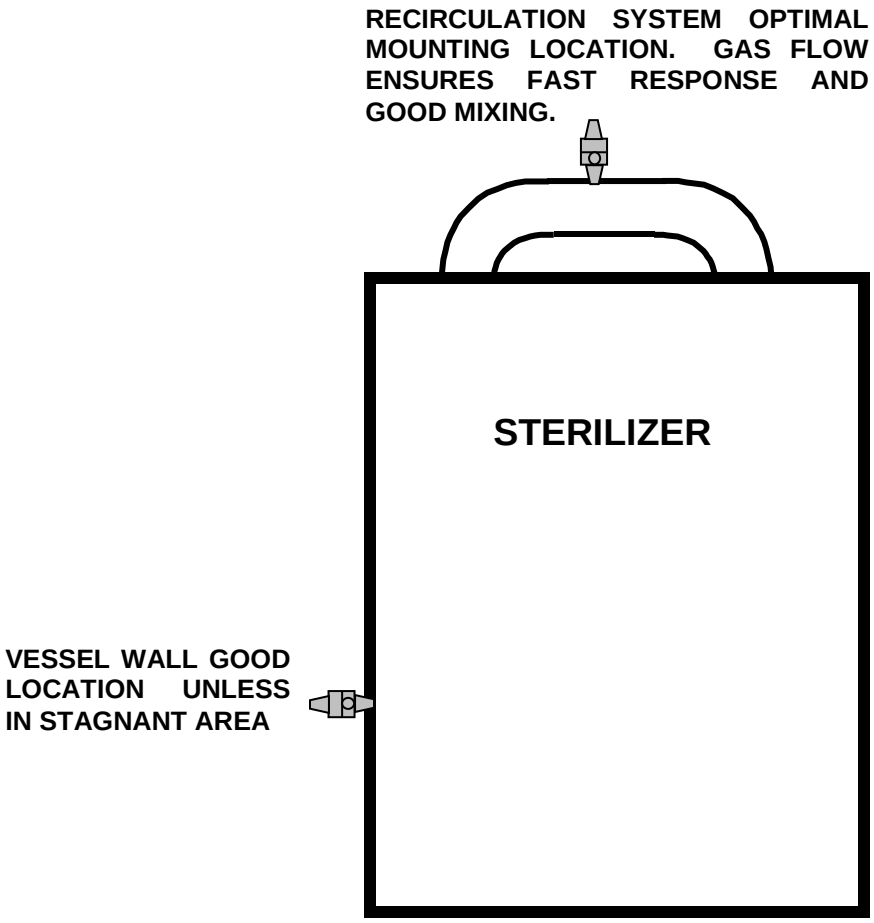
BLOCK WIRING DIAGRAM
SEC EtO Signature

FIGURE 3



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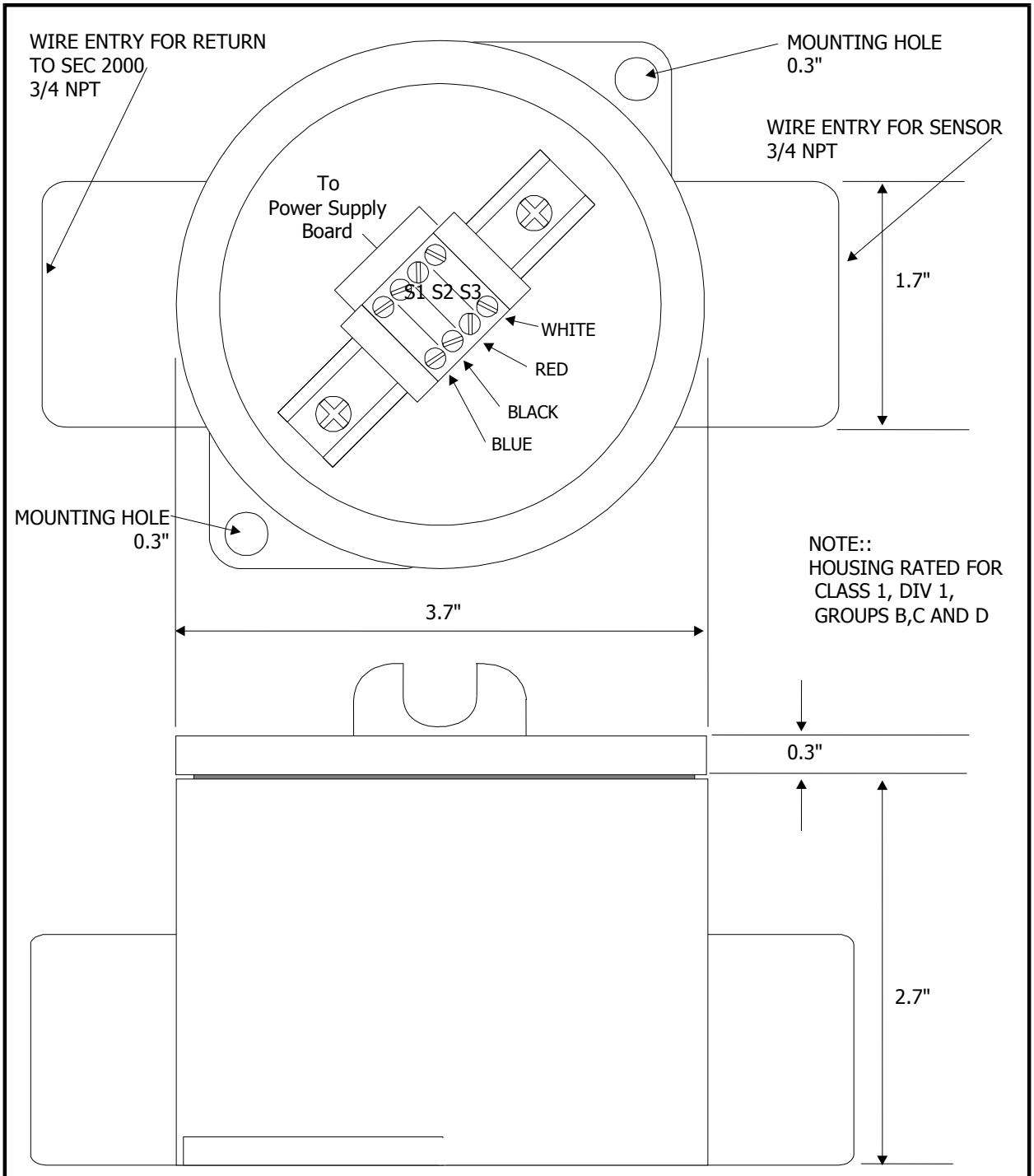
MECHANICAL DIAGRAM

FIGURE 4



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SEC SENSOR SEPARATION KIT

FIGURE 5